Handbook of Operating and Maintenance Instructions for...

Type 71 Noise Generator Power Supply

July 1957

Airborne Instruments Laboratory
INCORPORATED
160 OLD COUNTRY ROAD · MINEOLA, N.Y.

HANDBOOK OF
OPERATING AND MAINTENANCE INSTRUCTIONS
FOR
AIL TYPE 71 NOISE GENERATOR POWER SUPPLY

July 1957

AIRBORNE INSTRUMENTS LABORATORY, INC.
Mineola, New York

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_05255

TABLE OF CONTENTS

		Page
I.	Introduction and Description	1
II.	Operation	1
III.	Theory	2
IV.	Maintenance	4
	A. General	4
	B. Preventive Maintenance	4
	C. Corrective Maintenance	6
V.	Parts List	8

LIST OF ILLUSTRATIONS

Figure	
1	Type 71 Noise Generator Power Supply
2	Type 71 Noise Generator Power Supply, Schematic Diagram
3	Interior of Type 71 Noise Generator Power Supply, Top View
4	Panel of Type 71 Noise Generator Power Supply, Rear View

I. INTRODUCTION AND DESCRIPTION

The AIL Type 71 Noise Generator Power Supply (Figure 1) is intended for use with the AIL Type 70A and Type 70B Noise Generators. It provides the necessary high voltage for firing the argon-gas discharge tubes in both generators. The output discharge current of the tubes is adjustable up to 250 ma by means of a variable control. The Type 71 is furnished with 6-foot cables for connection to the Type 70. The Type 71 operates with an input of 115 volts, 50 to 60 cps, and 50 watts. The over-all dimensions are 11 inches wide by 8-1/2 inches high by 7-1/2 inches deep. The unit weighs about 7-1/2 pounds.

II. OPERATION

The Type 71 has three cables. Two cables supply voltages to the Type 70; the third is the power cord for connection to a supply of 115 volts, 50 to 60 cps. When the Type 71 is not in use, the cables are stored in the recessed back of the cabinet. To place the Type 70 in operation, proceed as follows:

1. Connect the two cables from the Type 71 to the Type 70. An inspection of the Type 70 will indicate the proper connections: one end of the generator has a screw-type connector; the other has a slide-type connector. Connect the screw-type connector first, making sure that the connector is fully seated. Care should be exercised when connecting the low-voltage connector to the generator. The connector must be inserted <u>in line</u> with the noise-generator axis, making sure that the tube pins line up with the connector; otherwise, the noise lamp will be damaged. The spring retaining ring under the lock nut must seat flush against the connector mount, without excessive pressure,

before the lock nut is tightened. The other connector is then pushed into position. A spring-loaded contact is connected to the anode end of the argon-gas discharge tube.

2. Plug the a-c line cord into a suitable source of primary power.

3. To fire the lamp, place the POWER ON/OFF switch in the ON position; the pilot lamp should light. Pull the START switch to the left, and permit it to snap back. This action causes a high-voltage pulse to be generated between the anode and the cathode of the tube; thus, the argon gas in the tube is ionized. Several operations of the START switch may be necessary to ignite the tube. If the tube fails to ignite after repeated operations, inspect the tube for possible defects. Refer to the Maintenance Section in the Handbook of Operation and Maintenance Instructions for Type 70 Noise Generator.

PRECAUTION

SINCE A HIGH-VOLTAGE PULSE IS GENERATED WHEN THE START SWITCH IS RELEASED, IT IS NECESSARY THAT THE CONNECTORS TO THE GENERATOR BE IN PLACE BEFORE THIS SWITCH IS OPERATED. ALWAYS CHECK THE CONNECTIONS AFTER EACH SETUP.

4. Once the argon-gas discharge tube has been fired, the LAMP CURRENT meter will indicate discharge current. Adjust the discharge current to about 150 ma by means of the INCREASE potentiometer. The current adjustment is not critical.

5. To turn the discharge off, place the POWER ON/OFF switch in the OFF position. Since the Type 71 uses a selenium rectifier, the generator can be turned on and off with no waiting time for warm-up.

III. THEORY

Figure 2 is a schematic diagram of the Type 71 Noise Generator Power Supply. Functionally, the Type 71 serves two purposes: (1) it generates filament current and a spike voltage to fire the argon-gas discharge tube in the Type 70 Noise Generators, and (2) it supplies sufficient anode current to the argon-gas discharge tube after starting to maintain the tube in operation.

Power is supplied to the input by means of a double-pole double-throw (POWER ON/OFF) switch. A 120-volt 3-watt lamp is paralleled to the line to indicate the presence of input power. Two 0.001-microfarad capacitors are placed across the input to filter any r-f components that might be present in the a-c supply line. A 1:1 isolation transformer is used along with a conventional type of half-wave voltage-doubler circuit. Selenium rectifiers are used. A 250-ma (LAMP CURRENT) meter in series with a 4-henry choke and the anode indicates either filament or gas discharge current in the gas tube. The two resistances, one fixed and the other variable, also in series with the anode, act as current limiters. The 0.006-microfarad capacitor across the START switch minimizes arcing when the switch is operated.

With the POWER ON/OFF switch in the ON position, various d-c voltages are generated (see Figure 2). The input a-c voltage to the Type 71 is rectified by the selenium-rectifier circuit. The resulting d-c voltage is filtered by two 40-microfarad electrolytic capacitors. When the START switch is in the START position, current flows through the 1-k limiting resistor to heat the filament of the argon-gas discharge tube. When the spring-loaded START switch is released, a spike of about 1500 to 2000 volts is generated across the anode of the tube. The momentary generation of filament current and the subsequent generation of spike voltage facilitate firing of the argon-gas discharge tube. The high spike voltage is a result of the sudden change in current in the choke when the START switch is released. The current through the choke then discharges through the limiting resistors and the anode; thus, the argon gas in the tube is ionized. The rating of the choke and the switching determine the amount of spike voltage obtained.

IV. MAINTENANCE

A. GENERAL

The preventive and corrective maintenance procedures outlined in this section should be followed to obtain maximum service from the equipment. The preventive-maintenance procedure consists of performing voltage measurements at significant points in the circuit, measurement of the start voltage spike, and a check of argon lamp-start and discharge current. For the start voltage spike measurement, it will be necessary to use a Tektronix Type 512 oscilloscope, or equivalent. The argon lamp-start and discharge current check will require the use of the Type 70 Noise Generator, or equivalent. The corrective maintenance procedure consists of performing trouble-shooting on the equipment, and repairing and replacing defective components. A trouble-shooting chart and necessary repair and replacement instructions are provided for the above purposes.

B. PREVENTIVE MAINTENANCE

1. Voltage Measurements

Measure the d-c voltage from the points indicated in Figure 2 to ground with a d-c voltmeter. The voltage values obtained under no-load conditions should be as specified in Figure 2. To perform these measurements, the a-c power plug of the Type 71 should be inserted into a 115-volt, a-c outlet and the POWER switch should be set to the ON position.

2. Start-Spike Measurement

Place a high resistance voltage divider across the anode and filament leads of the power supply. The voltage divider should consist of two 6.6-megohm 1-watt resistors in series. The filament connector of the Type 71 lead must be

shorted by a jumper or suitable adapter. The jumper or adapter is then connected to one side of the voltage divider. Connect a 10-megohm, 14-micromicrofarad oscilloscope probe between the midpoint of the divider and the signal input jack of a Tektronix Type 512 oscilloscope. This arrangement attenuates the spike voltage from the Type 71 by a factor of 20 to permit convenient reading of the spike on the oscilloscope. Take one end of a clip lead and form a coil of three turns around the high-voltage (anode) lead of the Type 71. Permit the end of this clip lead to remain unterminated. Connect the other end of this clip lead to the trigger input jack of the oscilloscope. This action will synchronize the oscilloscope to the spike. Connect the ground lead of the Type 71 to the ground terminal of the oscilloscope. Set up the oscilloscope with a sweep repetition rate of 10,000 microseconds. Proceed to measure the spike as follows:

a. Place the a-c power plug of the Type 71 into a 115-volt a-c outlet.

b. Set the POWER switch to the ON position.

c. Close the spring-loaded START switch, and release it quickly. Observe and measure the spike on the oscilloscope while operating the START switch. The oscilloscope reading multiplied by 20 is the spike voltage. The spike should be in the 1500 to 2000 volt range.

3. Lamp-Start and Lamp-Discharge Current Check

To perform this check, follow the instructions in Section II, Operation, steps 1, 2, and 3. Once the setup is made and the lamp (argon gas discharge tube in the Type 70) is fired, turn the INCREASE potentiometer to the maximum position and observe the LAMP CURRENT meter. The meter should indicate more than 250 ma. With the lamp still fired, turn the INCREASE potentiometer to its minimum position. The meter should now indicate a value less than 170 ma.

C. CORRECTIVE MAINTENANCE

1. Trouble-Shooting Chart

If troubles are encountered with the Type 71, refer to the Trouble-Shooting Chart, which lists the symptoms, probable causes, and corrective action to follow.

2. Repair and Replacement

Once the trouble has been located, it should be corrected. The trouble may be an open lead or connection or a defective component. Figures 3 and 4 identify all internal components of the Type 71. Be sure to remove all power to the equipment being repaired. If replacement of the choke is necessary, check that the insulator tubing is placed over the new choke leads before installation.

TROUBLE-SHOOTING CHART

Symptom	Probable Cause	Corrective Action
1. B+ present at the anode connector but no spike voltage.	1. Open 1-k 50-watt current-limiting resistor.	1. Replace.
	2. Defective filament connector.	2. Check for defects. Repair or replace, if necessary.
	3. Defective filament.	3. Replace lamp.
2. Spike voltage not available at the anode connector and filament voltage present at the filament connector.	1. Open 300-ohm 25-watt fixed, current-limiting resistor.	1. Replace.
	2. Defective 750-ohm 25-watt (INCREASE) potentiometer.	2. Replace.
	3. Defective anode connector.	3. Repair or replace, if necessary.
	4. Defective START switch.	4. Replace.
	5. Defective filament.	5. Replace lamp.
3. Spike voltage not available at the anode connector and filament current indicated on the LAMP CURRENT meter when the START switch is operated.	1. Defective START switch.	1. Replace START switch.
	2. Improper voltages at A, C, E, or F due to defective 10-ohm 2-watt resistors, selenium rectifiers, meter, or 4-henry choke.	2. Check voltages at significant points to determine defective component.
	3. Blown 2-amp fuse.	3. Replace fuse.
	4. Defective 0.006-microfarad capacitor.	4. Replace capacitor.

V. PARTS LIST

The Table of Replaceable Parts for the Type 71 is included in this section. The table lists the item, the description, the function, the manufacturer, and the manufacturer's part number.

TABLE OF REPLACEABLE PARTS

Reference Symbols	Item	Description	Function	Manufacturer	Mfr. Part No.
I1	Bulb	120 volts 3 watts	Indicates presence of line voltage	General Electric	3S6, or equivalent
C1	Capacitor	0.006 μf 1600 volts	Minimizes arcing of START switch	Sprague	MB-D6, or equivalent
C2 and C3	Capacitor	40 μf, supplied with insulated sleeve and insulated mounting ring	Filters d-c voltage	Cornell-Dubilier	UPT 4045, or equivalent
C4A, B	Capacitor	0.001 μf 600 volts	Bypass capacitor	Centralab	DD2-102, or equivalent
L1	Choke	4 henries	Generates spike voltage necessary to fire argon gas discharge tube	Triad	C15X, or equivalent
J1	Connector and Cable Assembly	Double-pin receptacle	Low-voltage connection to filament of argon gas discharge tube	AIL	3471-02C31
J2	Connector and Cable Assembly	Single-pin plug	High-voltage connection to anode of argon gas discharge tube	AIL	3471-02C22
F1	Fuse	4AG, 2 amperes	Protects Type 71 from overload	Littelfuse	357002, or equivalent

TABLE OF REPLACEABLE PARTS (cont)

Reference Symbols	Item	Description	Function	Manufacturer	Mfr. Part No.
SW2	Switch	Toggle, dpdt	Controls the application of input power	AH & H	1031, or equivalent
	Terminal Strip		Connector	Cinch	1532A, or equivalent
T1	Transformer	1:1 turns ratio	Isolates a-c supply line from equipment	Triad	N51X

RETURN OF EQUIPMENT TO FACTORY FOR REPAIRS

If it has been found necessary to return the equipment to the manufacturer for repairs, please write first to the AIL Sales Department, giving complete information concerning the nature of the failure and the manner in which the equipment was used when failure occurred. Also provide the TYPE AND SERIAL NUMBERS of the unit. Special instructions will then be supplied to the customer for shipping the unit back for repairs. All equipment should be packed and shipped, in accordance with these instructions, with transportation charges prepaid. A failure report should accompany shipment of the equipment.

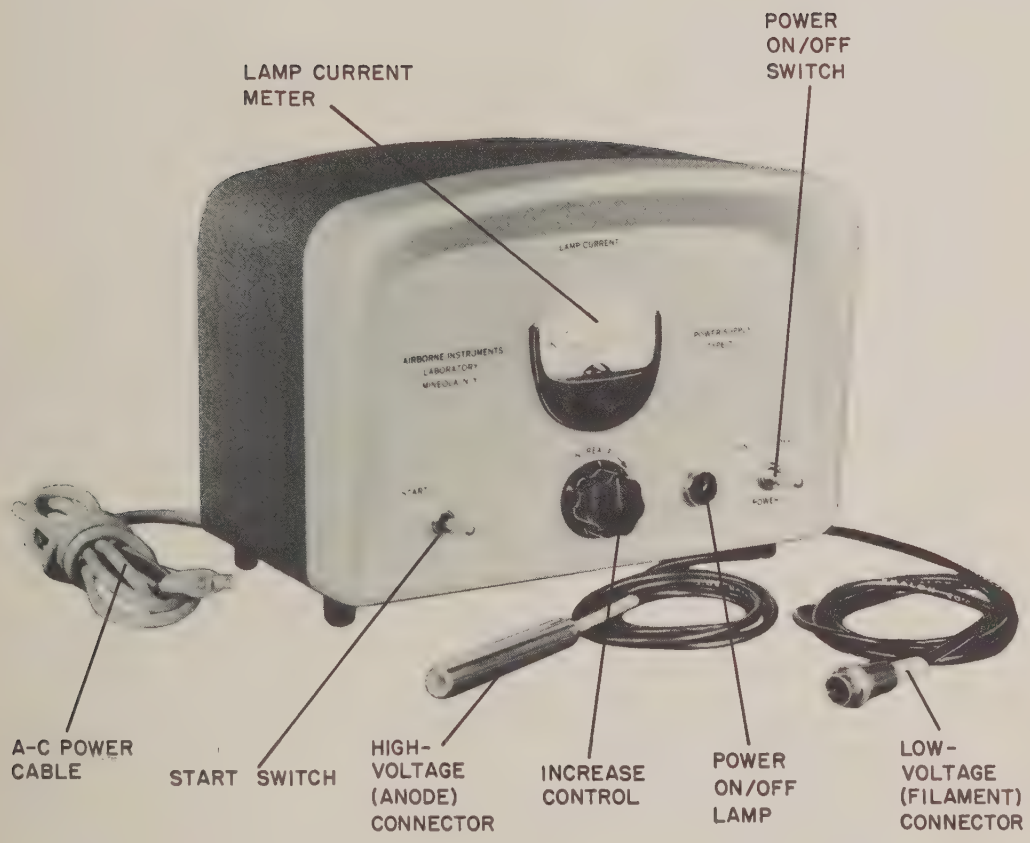
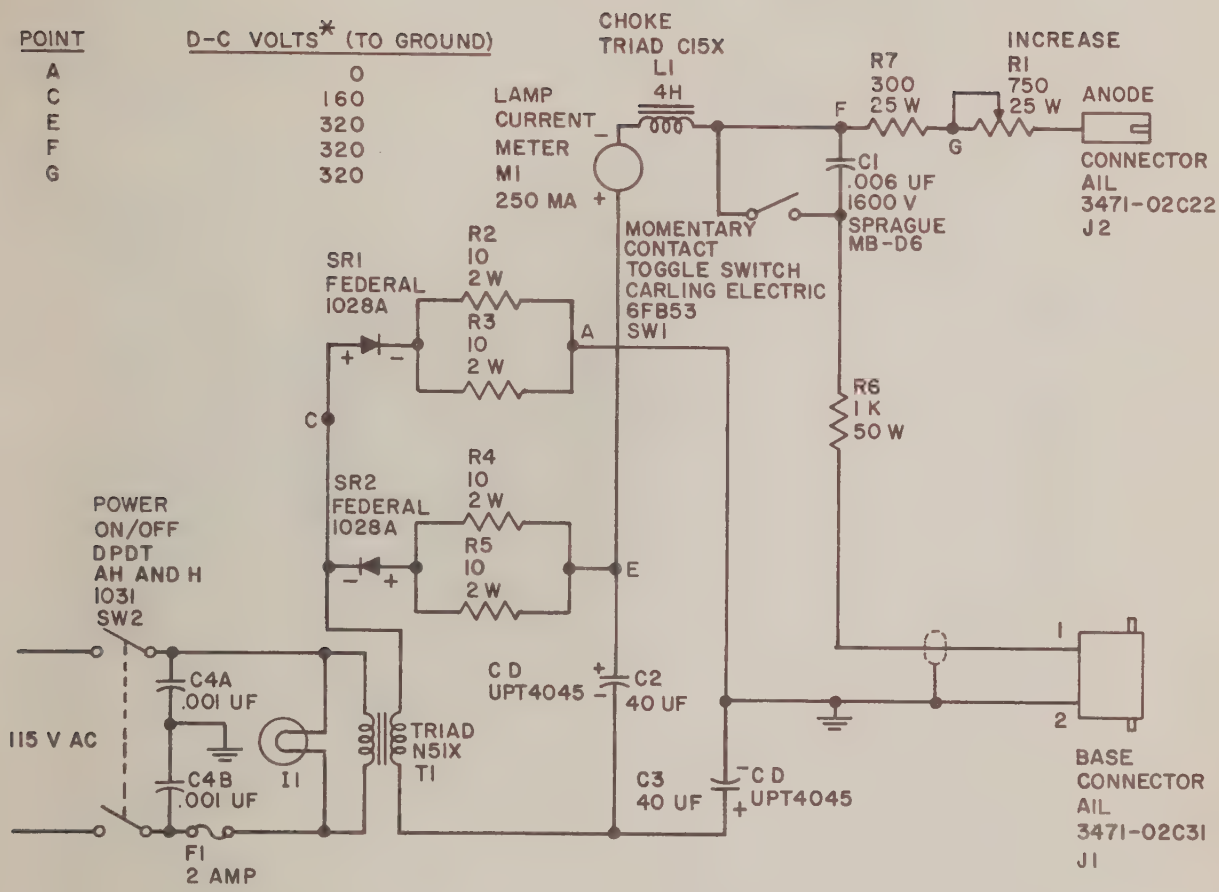


FIGURE 1. TYPE 71 NOISE GENERATOR POWER SUPPLY



* UNDER NO-LOAD CONDITIONS

UNLESS OTHERWISE NOTED:
RESISTOR VALUES ARE GIVEN IN OHMS

FIGURE 2. TYPE 71 NOISE GENERATOR POWER SUPPLY, SCHEMATIC DIAGRAM (STARTING WITH SERIAL NO. 51)

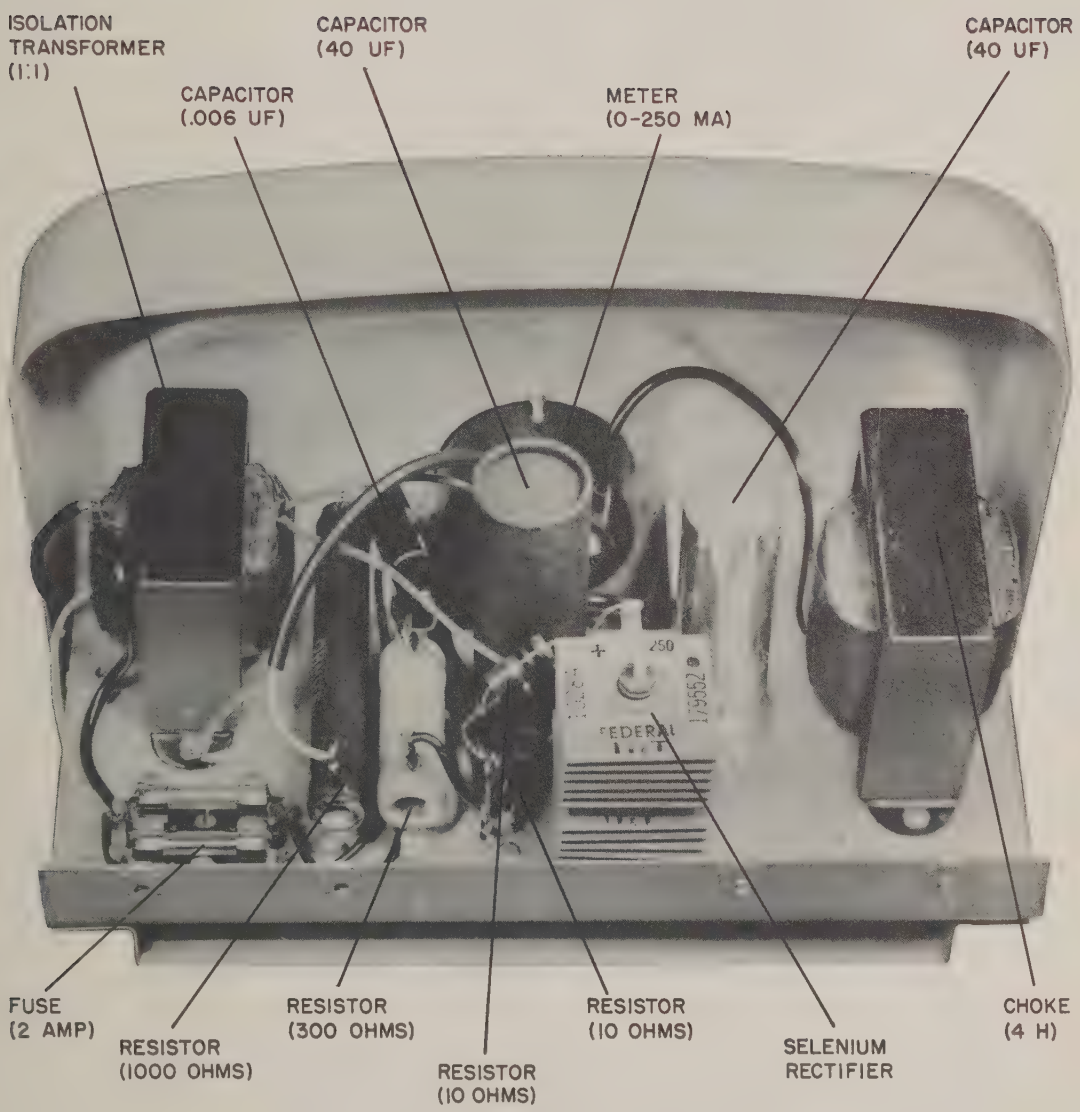


FIGURE 3. INTERIOR OF TYPE 71 NOISE GENERATOR POWER SUPPLY, TOP VIEW

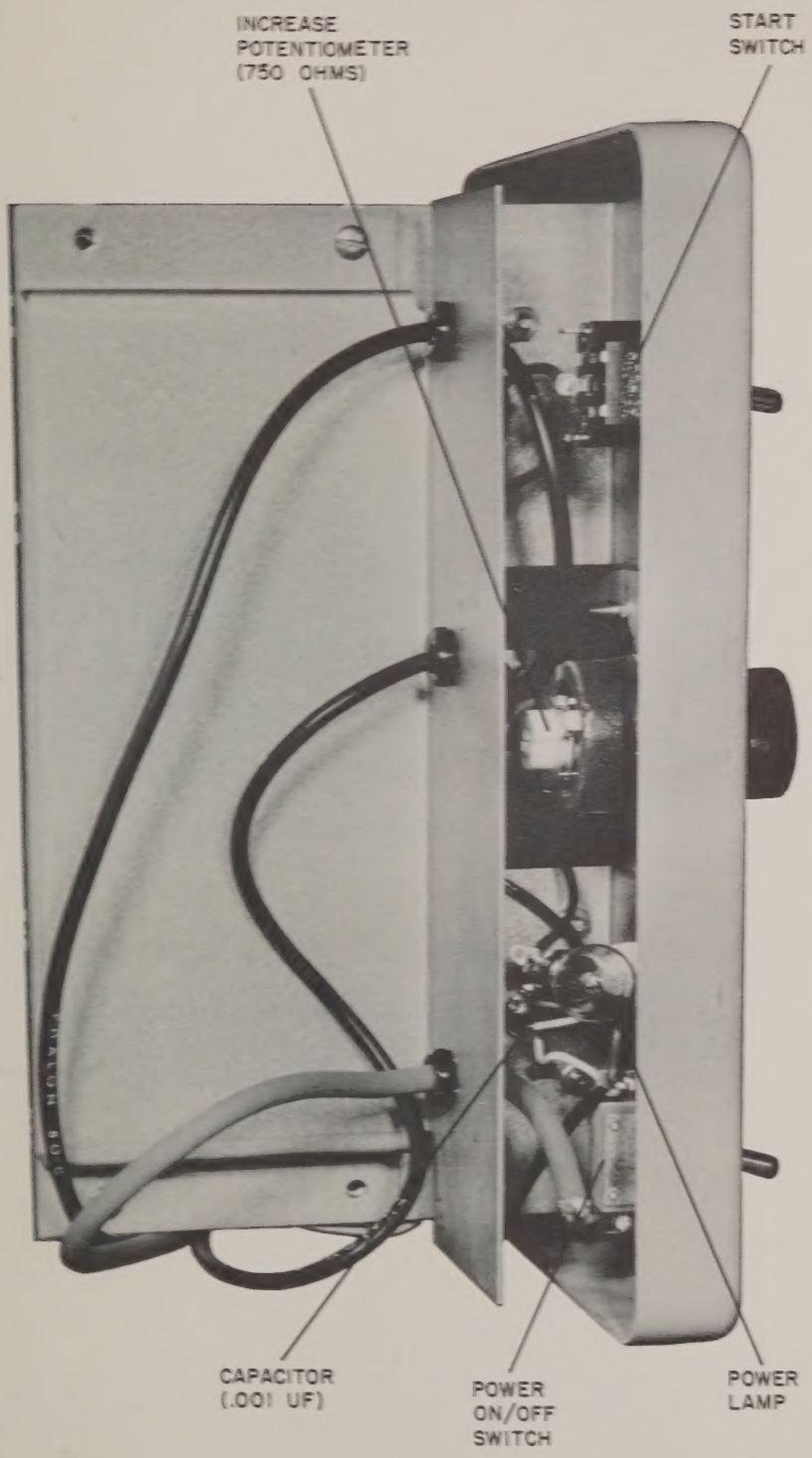


FIGURE 4. PANEL OF TYPE 71 NOISE GENERATOR POWER SUPPLY, REAR VIEW